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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/728,295	12/04/2003	Mohamed Y. Soliman	2003-IP-011150U1	7913

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EXAMINER	
GEBRESILASSIE, KIBROM K	
ART UNIT	PAPER NUMBER
2128	
MAIL DATE	DELIVERY MODE
11/16/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/728,295	SOLIMAN ET AL.	
	Examiner	Art Unit	
	Kibrom K. Gebresilassie	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 September 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on *06 March 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is responsive to amended application filed on 09/24/2007.

2. Claims 1-29 are presented for examination.

Continued Examination Under 37 CFR 1.114

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09/24/2007 has been entered.

Response to Arguments

4. Response to Claim Objection: Applicant's have amended the claims to overcome the objection and are therefore the objection is withdrawn.

5. Response to 101 rejection: Applicant's have amended claims 1, and 18 to overcome the 101 rejection. The amended claims could not overcome the 101 rejection (See: ***Claim Rejections - 35 USC § 101 Below***).

6. Response to 102 rejection: Applicant's arguments have been fully considered but they are not persuasive.

a. Applicant's argued that the reference does not disclose the limitation of:

"determining one or more geomechanical stresses **induced by each fracture based on the dimensions and location of each fracture.**"

In response, Soliman et al teaches:

Stress Magnitude and Orientation

The first parameter to be determined is the fracture orientation with respect to the wellbore. Because fractures are always perpendicular to the least principal stress, the questions actually concern wellbore- and stress-orientation measurements.

plane. If the horizontal segment is drilled in the direction of the least stress, several vertical fractures may be spaced along its axis wherever perforations are present. This spacing is one of the design parameters to be selected. Usually, this is investigated with numerical simulators. If the horizontal segment is drilled perpendicular to the least stress, one vertical fracture will be created parallel to the well. Figs. 1 and 2 show fracture direction vs. well direction. **(See: page 966).**

As noted above, for every horizontal segment drilled perpendicular to the least stress, one vertical fracture will be created as claimed invention.

Further,

Determining Magnitude and Orientation of Least Principal Stress

If field history does not clearly reveal the orientation and magnitude of the least principal stress, on-site tests should be performed to determine these parameters. Three methods to determine stress magnitude and/or orientation exist. Microfracturing, described by Daneshy *et al.*,[12] may be used to measure the least principal stress and fracture orientation directly. Long-spaced sonic logging may be used to estimate stress magnitude; however, logging has the disadvantage of ignoring tectonic stresses. Strain relaxation may also be used to estimate magnitude and orientation.[13] Because the openhole microfracturing technique is a direct measurement of stress magnitude and orientation, it is recommended for new reservoirs. **(See: page 967).**

b. Applicant's argued that the reference does not disclose the limitation of:

"determining a geomechanical maximum number of fractures based on the geomechanical stresses induced by each of the fractures."

In response, Soliman et al teaches:

Determining the Optimum Number of Fractures

To determine the optimum number of fractures intercepting the horizontal wellbore

that is necessary to produce the formation, **(See: page 968-969).**

Fig. 13 shows that, initially, total flow rate increases as the number of fractures increases. The total flow rate reaches a maximum, and then it declines. The number of fractures at which the maximum flow rate occurs declines with time, reaching five fractures after 1 month but declining to only two fractures after 24 months. The decline **(See: page 969, middle column).**

Further,

axis) and k_y being perpendicular to k_x. The $k_x/k_y = 1.0$ curves in Fig. 16 are the same as those in Fig. 15, and they show five fractures as optimum. When $k_x < k_y$, fewer fractures are needed to produce the reservoir. This is demonstrated for the case with $k_x/k_y = 0.10$, which results in three fractures being optimum. When $k_y < k_x$, the optimum number of fractures increases. In fact, for the case shown in Fig. 16 ($k_x/k_y =$ **(See: page 969).**

7. Examiner finds applicant's argument unpersuasive and ~~is~~ therefore the rejection is maintained.

Claim Objection

8. Claim 24 is objected to because of the following informalities: "generate" should be replace with "generating". Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 1-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

c. It is unclear what "optimizing" mean in the claims.

d. Claims 1, 18, and 24 recite "predicted stress field". It is unclear what does that mean.

e. Claim 2, 19, and 25 recite "...performed **prior to creating** any of the fractures....". It is unclear what applicant mean by "prior to creating any of the fractures". There is no any step that shows a "creation" of fractures in claims 1, 18, and 24 (See: missing steps).

10. Claims 1, 18, and 24 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are:

f. As per claim 1, 18, and 24, for example claim 1 recites:

> (c) determining a predicted stress field based on the geomechanical stresses induced by each fracture; and
>
> (d) generating an optimized number, placement and size for one or more fractures in a subterranean formation.

there is missing steps between the steps of (c) and (d). It is unclear how to get from step (c) to step (d).

g. As per claims 1, and 18, "predicting" stress field, "optimizing" a number, and/or "creating" fractures are omitted steps.

h. As per claim 24, "predicting" a stress field, and/or "creating" fractures are omitted steps.

11. All dependent claims which depend on rejected claims are also rejected because of their dependency.

Claim Rejections - 35 USC § 101

12. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

13. Claims 1-29 are rejected under 35 U.S.C. 101 because the claims are directed to a judicial exception to 35 U.S.C. 101 i.e. natural phenomenon and are not directed to a practical application of such judicial exception because the claims do not require any physical transformation and the invention as claimed do not produce a useful, concrete, and tangible result.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

14. Claims 1-29 are rejected under 35 U.S.C. 102(b) as being anticipated by M.Y. Soliman, J. L. Hunt, and A. M. Elrabaa, "Fracturing Aspects of Horizontal wells", herein referred as Soliman, 1990 Society of Petroleum Engineers, pages 966-973.

As per Claim 1:

Soliman discloses a method of optimizing a number, placement and size of fractures in a subterranean formation (**See: "Summary" in page 966**) comprising the steps of:

(a) determining one or more geomechanical stresses induced by each fracture based on the dimensions and location of each fracture (**See: page 967, "Determining Magnitude and Orientation of Least Principal Stress"**);

(b) determining a geomechanical maximum number of fractures based on the geomechanical stresses induced by each of the fractures (such as...***reaching five fractures after a month(i.e. five fractures are maximum number of fractures) but declined to only two fractures after 24 month...***;**See: page 969, middle column, lines 9-13**);

(c) determining a predicted stress field based on the geomechanical stresses induced by each fracture (**See: page 967, "Determining Magnitude and Orientation of Least Principal Stress"**); and

(d) generating an optimized number, placement and size of one or more fractures in subterranean formation (**See: Figs. 15, 16, 17, table 2 and corresponding texts**).

As per Claim 2:

Soliman discloses the method according to claim 1, wherein steps (a), (b), and (c) are performed prior to creating any of the fractures in the subterranean formation (such as ***...a simulated fracture is initiated...*;See: page 971, left side, lines 5-10).**

As per Claim 3:

Soliman discloses the method according to claim 1, further comprising the steps of: determining a cost-effective number of fractures; determining an optimum number of fractures, where the optimum number of fractures is the maximum cost-effective number of fractures that does not exceed the geomechanical maximum number of fractures (such as ***determine the optimum location of the well to yield maximum exposure of the pay zone...*; See: page 970, right side, lines 15-17).**

As per Claim 4:

Soliman discloses the method according to claim 1, further comprising the step of spacing the fractures a uniform distance from each other (**See: Fig. 2**).

As per Claim 5:

Soliman discloses the method according to claim 1, further comprising the step of creating the fractures with a uniform size (such as...***fractures are identical in physical dimensions....*;See: page 969, left side column, lines 3-5).**

As per Claim 6:

Soliman discloses the method according to claim 1, further comprising the steps of: creating one or more fractures in the subterranean formation; and repeating steps (a), (b), and (c) after each fracture is created (such as ***...multiple fractures may be***

***created...*;See: "Conclusion" lines 1-3**).

As per Claim 7:

Soliman discloses the method according to claim 6, wherein the repeating step comprises the steps of gathering and analyzing real-time fracturing data for each fracture created (such as ***...an actual well was logged between....*;See: page 971, right side, lines 1-4; Table 2**).

As per Claim 8:

Soliman discloses the method according to claim 7, wherein a well is placed in the subterranean formation, the well comprising a wellhead, a tubing, and a well bore (**See: fig. 2**), the well bore comprising a downhole section, and wherein the gathering of real-time fracturing data comprises the steps of: (i) measuring a fracturing pressure while creating a current fracture (such as ***...the limits of the treatment pressure to achieve certain fracture growth can be determined...*;See: page 970, right side, lines 4-14**); (ii) measuring a fracturing rate while creating the current fracture; and (iii) measuring a fracturing time while creating the current fracture (such as ***...the number of fractures at which the maximum flow rate occurs declines with time...*;See: page 969, middle column, lines 9-13**).

As per Claim 9:

Soliman fails expressly to disclose one or more transducers located at the wellhead. However, the limitation, one or more transducers, is deemed to be inherent to the teaching of Soliman as page 970 right side column, lines 4-14, which shows determination of pressure. The determination of pressure will be impossible if there is

no any sensing device at the wellhead in the system of Soliman.

As per Claim 10:

Soliman fails expressly to disclose one or more transducers located at the down hole. However, the limitation, one or more transducers, is deemed to be inherent to the teaching of Soliman as page 970 right side column, lines 4-14, which shows determination of pressure. The determination of pressure will be impossible if there is no any sensing device at the down hole in the system of Soliman.

As per Claim 11:

Soliman discloses the method according to claim 8, wherein the fracturing pressure is measured in the tubing (such as ***...equation A-5 and A-6 ensure the continuous change of pressure and rate inside the fracture...***; **See: Appendix A equation A-5 and A-6**).

As per Claim 12:

Soliman discloses the method according to claim 7, wherein analyzing of real-time fracturing data comprises the steps of: determining a new stress field, based on the real-time fracturing data; and comparing the new stress field with the predicted stress field (such as ***an actual well with stress every 10 ff and ...simulated fracture... and comparison is done in Fig. 17***; **See: page 971, left side, lines 1-15**).

As per Claim 13:

Soliman discloses the method according to claim 12, further comprising the step of decreasing the number of fractures in response to the real-time fracturing data (such as ***...the number of fractures at which the maximum flow rate occurs declines***

***with time...*;See: page 969, middle column, lines 9-13**).

As per Claim 14:

Soliman discloses the method according to claim 12, further comprising the step of increasing the distance between the fractures in response to the real-time fracturing data (such ***as... penetrate 40 ft, instead of 5ft,....*;See: page 971, left side, lines 25-37).**

As per Claim 15:

Soliman discloses the method according to claim 12, further comprising the step of adjusting the size of the fractures in response to the real-time fracturing data (such as ***...the limits of the treatment pressure to achieve certain fracture growth can be determined...*;See: page 970, right side, lines 4-14**).

As per Claim 16:

Soliman discloses the method according to claim 1, wherein the subterranean formation comprises a well bore comprising a generally vertical portion (such as ***...vertical fracture....*;See:** page 967, right side column, lines 36-40; Fig. 3 ***Vertical and horizontal wellbore***).

As per Claim 17:

Soliman discloses the method according to claim 16, wherein the well bore further comprises one or more laterals (Fig. 2).

As per Claims 18-29:

The limitations of claims 18-29 have already been discussed in the rejection of Claims 1-3, 6, 7, and 12. They are therefore rejected under the same rationale.

Conclusion

15. All claims are rejected.

Examiner Remarks

16. Examiner's Note: **Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicant.** Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages and figures may apply as well. **It is respectfully requested from the applicant in preparing responses, to fully consider the references in their entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner.**

Examiner Request

17. **In the case of amending the claimed invention, Applicant is respectfully requested to indicate the portion(s) of the specification which dictate(s) the structure relied on** for proper interpretation and also to verify and ascertain the metes and bounds of the claimed invention.

MPEP states:

"...with respect to newly added or amended claims, applicant should show support in the original disclosure for the new or amended claims. See MPEP § 714.02 and § 2163.06."

Communications

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kibrom K. Gebresilassie whose telephone number is 571-272-8571. The examiner can normally be reached on 8:00 am - 4:30 pm Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini S. Shah can be reached on 571-272-2279. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KG

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